Where Are People from to Pay Their Respects to the Queen? - An Exploration on Place of Origin Based on Mobile Apps GPS Data

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Summary

This study attempted to explore the place of origin of people who paid their respects to the Queen Elizabeth II. Using Mobile Apps GPS dataset, we went backwards to the starting point of peoples' trips who came to queue in the site, then origin information based on the local authority districts level of these people was found. The results are visualized in the UK map. According to the results, we can know people's emotional intensity for the Queen in different regions.

KEYWORDS: Queen Elizabeth II; Place of Origin; Mobile Apps GPS Data

1. Introduction

Queen Elizabeth II, whose reign was the longest of any British monarch and the longest verified reign of any female monarch in history, died on 8 September 2022 at Balmoral Castle in Scotland ('Elizabeth II', 2023). As the most beloved monarch in the world, the UK observed a national mourning period of 10 days for the Queen. About 250,000 people from all over the world waited in the queue to pay their respects when the Queen's lying in state took place in Westminster Hall in London from 14 to 19 September. Exploring the original places of people who came to pay their respect is essential to reveal the impacts of the monarchy. It will also provide valuable knowledge for understanding the potential political transformations in the post-Queen era.

At present, most studies use questionnaires to find out information about the population's place of origin (Kuusio, H. et al., 2021). But the method of the survey has its limitation. The willingness of customers to fill out the questionnaire is usually low, and the return rate of valid questionnaires is generally not high. At the queue site, some reporters interviewed verbally to find out where people were from, but only a very small number of people were asked. This shows the limitations of questionnaires and verbal interviews.

In order to overcome the limitations of traditional surveys, mobile phone App data can be used to effectively determine the original place of people. When people use the App on their mobile phones, the information about their time, location and movement will be recorded. These unique strengths of mobile phone App data help us track the original places of observed people precisely and timely.

This paper aims to explore the original place of people who paid their respects to the Queen. Mobile phone App dataset will be used to determine the starting points of users' trips who came to queue in the site. The details of data, methodologies and case study are given as below.

2. Case Study Area & Data

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According to **Figure 1**, the queue formed on the Albert Embankment, ran along Belvedere Road behind the London Eye, and headed onto the South Bank where it followed the River Thames past the National Theatre, Tate Modern and HMS Belfast through to Southwark Park (UK Government, 2022). The total length of the route is about 9km, and we selected a 50 meters buffer zone (zone width is 100 meters) on each side of the route as a case study area (UK Government, 2022).

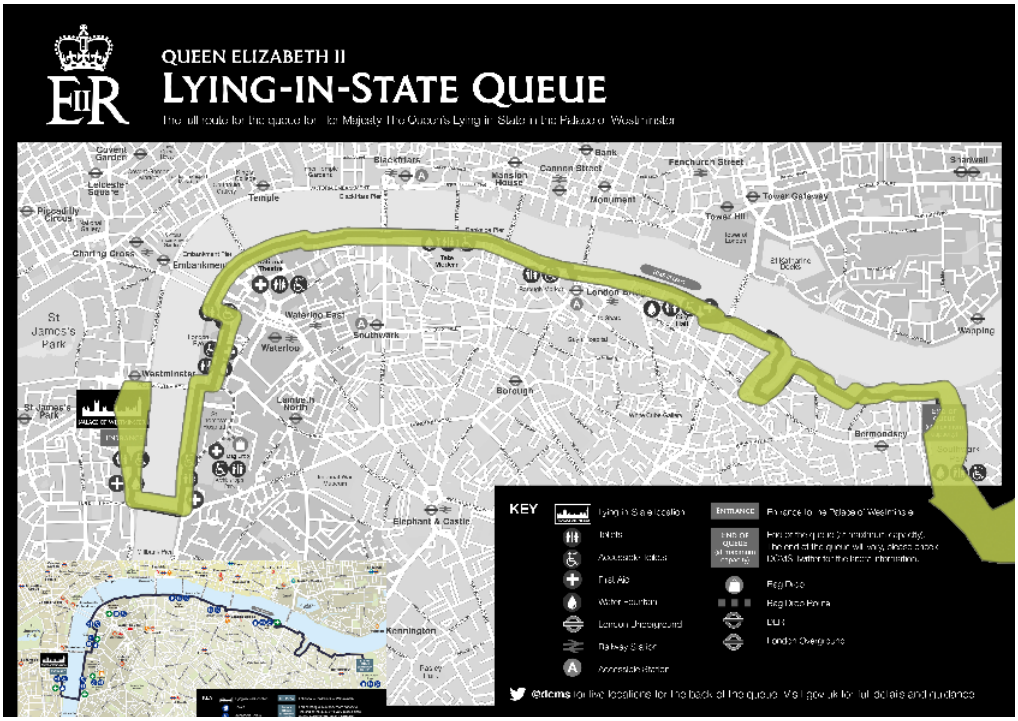

Figure 1 Case Study Area – Queue Site

As the coffin arrived in London on September 14, and Westminster Hall is open 24 hours from 5:00 p.m. on September 14th until 6:30 a.m. on September 19th for viewing of the Queen's coffin. We selected GPS data during this time for analysis. There are about 22000 GPS point data in this period, generated by 1001 user devices. Of these, the number of users with less than 30 hours was 898, which is counted as the number of people who came here to pay their respects. According to the statistics (**Figure 2**), the average stay time of 787 people is within 10 hours, accounting for 87.6% of the total number of people, and the average stay time of 153 people is between 10 and 20 hours, accounting for 17.0% of the total number of people.

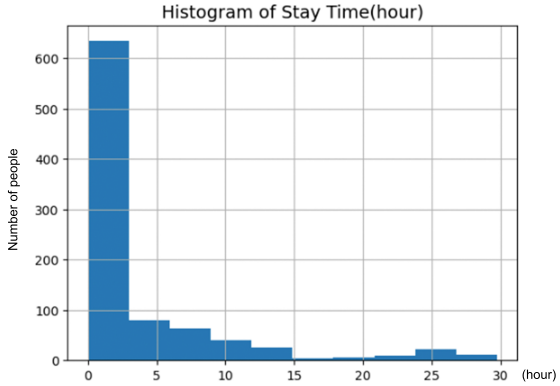

Figure 2 Histogram of Stay Time

The spatial unit we used for spatial analysis is local authority, the local authority district boundary data was obtained from https://statistics.ukdataservice.ac.uk/dataset/2011-census-geography-boundaries-local-authorities, which contains 404 geographical areas in whole UK.

3. Workflow

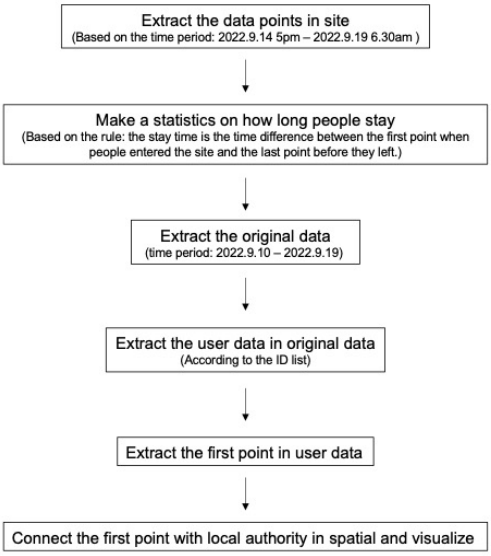

Figure 3 Workflow

As shown in **Figure 3**, to begin with, we selected the data from dataset from September 14 5pm, 2022 to September 19 6.30am, 2022, and used the spatial join function to extract the data points of people who came to queue. We used this rule to count the stay time of people: the time difference between the first point when people entered the site and the last point before they left is defined as their stay time. The results of the stay time statistics in the site are shown in section 2.

Then, we extracted the ID list of people who have entered the area. As the UK government announced the specific arrangements for the Queen's Funeral on September 10, considering the possibility that people came to London to lay flowers and pay their respect from a relatively distant place and the time spent on the road, we selected the data from September 10, 2022 to September 19, 2022 in the original dataset for extraction of place of origin. We extracted all the data containing IDs of people who came to the site and extracted the information of the first appearance (first point) of each person. Finally, based on the latitude and longitude information contained in the first point data, the spatial join function was used to connect with local authorities to calculate the number of first points contained in each local authority and the result was visualized in the UK map.

4. Result

Figure 4 shows the visualization results of original places of people who paid their respect to the Queen. According to our summary, a total of 198 local authority districts had people who went to condole for the Queen. Among of them, 184 districts are in England (92.9%), 7 districts in Wales (3.5%), 1 district in North Ireland (0.5%), and 6 districts in Scotland (3.0%).

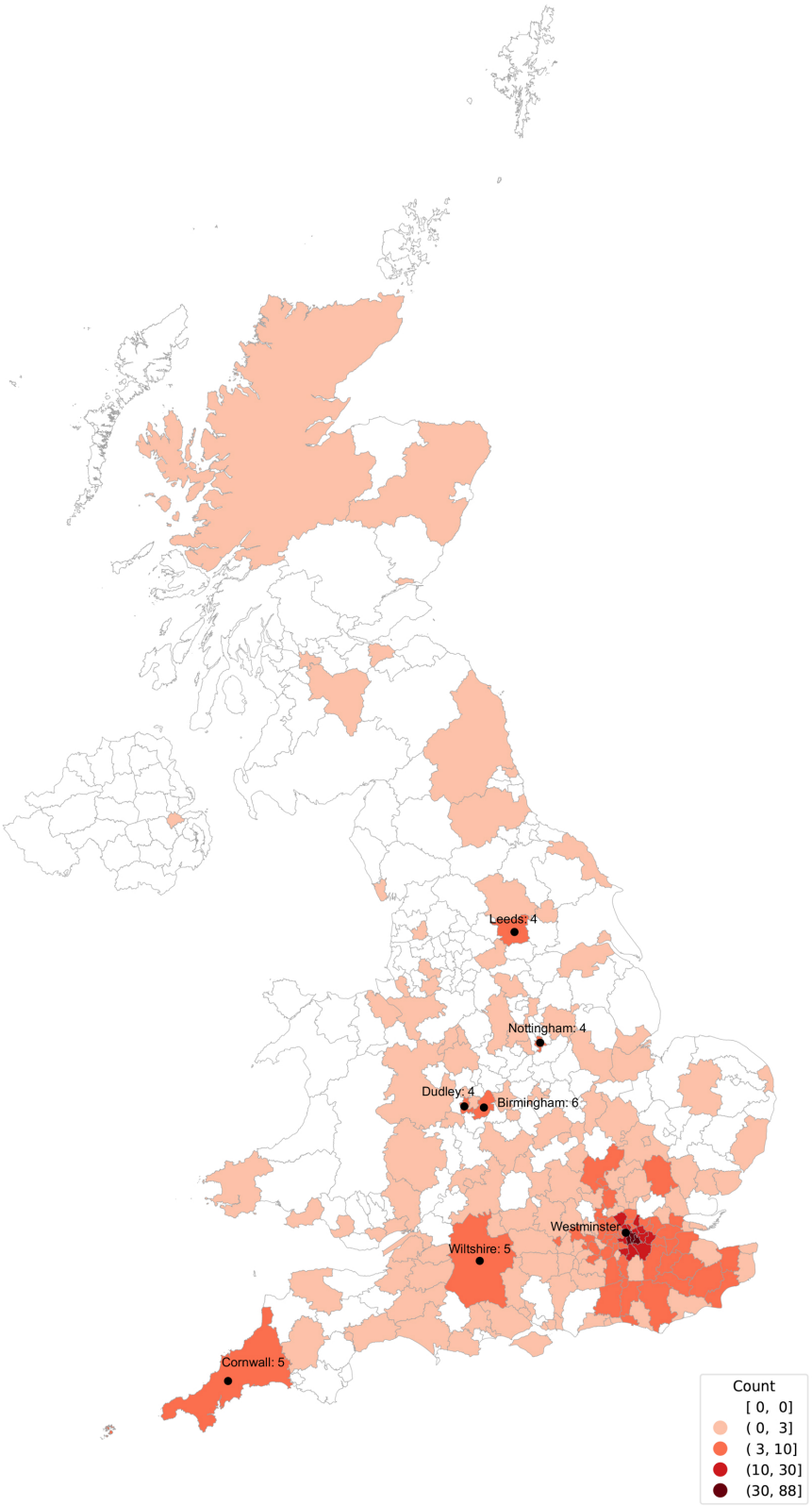

Figure 4 Original Places of People Who Paid Their Respects

From the resulting map, the closer the area to the queueing site, the more people went to pay their respects, and this is illustrated by the fact that the color of the surrounding local authority districts gradually became lighter, with Westminster (where the Queen's coffin is located) as the center radiating outward. Considering that four local authority districts near Westminster are along the rear of

queue route, the higher number may be due to the capture of local residents passing by the route, but the overall trend shown in the map remains as described in the previous sentence. Areas farther away from the radius of Westminster have more people from the following areas: Nottingham: 4, Dudley: 4, Leeds: 4, Cornwall: 5, Wiltshire: 5, Birmingham: 6, indicating that people from these areas have a deeper affection for the Queen.

5. Conclusion

This study attempted to detect where people who pay their respects to Queen Elizabeth II come from. We extracted the ID information of people who came to the queue and used the ID in the original data to get the information of place of origin based on the GPS dataset. The results show the number of people from different local authority districts who came to the site to pay their respects to the Queen. Among 4 countries of the United Kingdom, England had the highest number of people paying respects to the Queen. The results indicate that the closer the district is to the queue site, the more people go to queue to condole for the queen, regardless of the geographic level. In addition, areas such as Birmingham, Wiltshire and Cornwall, although farther away from London, also had relatively high attendance, indicating the deep affection of the people in these areas for the Queen. In a follow-up study, the result can be spatially analyzed with socio-demographic information and political opinions of people in each district.

The results show the effectiveness of the GPS dataset for exploring the original places of people. Since our data is updated in real-time, we can combine real-time data to explore issues related to the mobility of people in current social events; such as the place of origin information and the dwell time in a place; combined with the travel mode information in the dataset, we can also explore how they come to a place through different modes of transportation; combined with other datasets (e.g., POI data), it is also possible to understand how people travel differently across different industries. At a time when the covid-19 pandemic and influenza are widespread, understanding the changes and impacts of crowd movement can be useful for future urban policy and planning.

References

‘Elizabeth II’ (2023). *Wikipedia.* Available at https://en.wikipedia.org/wiki/Elizabeth_II (Accessed: 4 January 2023).

‘The Queue’ (2023). *Wikipedia.* Available at https://en.wikipedia.org/wiki/The_Queue (Accessed: 4 January 2023).

Kuusio, H. et al. (2021) ‘Response activity in mixed-method survey data collection—the methods used in a survey among the foreign-born population in Finland (FinMonik)’, *International Journal of Environmental Research and Public Health*, 18(6), p. 3300. doi: https://doi.org/10.3390/ijerph18063300.

UK Data Service (2022). *2011 Census Geography boundaries (Local Authorities).* Available at: https://statistics.ukdataservice.ac.uk/dataset/2011-census-geography-boundaries-local-authorities (Accessed: 4 January 2023).

UK Government (2022). *QUEEN ELIZABETH II Lying-in-State Queue*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1104221/Queue_route_map.pdf (Accessed: 4 January 2023).

UK Government (2022). *Queue route announced for Her Majesty The Queen’s Lying-in-State.* Available at: https://www.gov.uk/government/news/queue-route-announced-for-her-majesty-the-queens-lying-in-state (Accessed: 4 January 2023).

Biographies

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